Behavior Concerning Choosing Workstations in Non-territorial Offices

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Abstract
This paper attempts to clarify how employees choose individual workstations in a non-territorial office, in which they may locate themselves anywhere as they wish. The authors ascertained the preference of employees with regard to the positions of their workstations and the consistency of choosing the same workstations. The results are as follows: for all the investigated employees, there was a tendency to choose workstations that were adjacent to the main corridors and close to the meeting corners. More than 70% of the employees either chose the same workstation every time or nearly every time. In total, 90% of the employees were found to locate in the same or in adjacent areas. Analysis by group showed that while employees in the engineering groups, the renovation design group (Architecture Group 3), and the competition team were inclined to locate in specific areas and use such areas consistently, employees in the other architecture groups were much more open to choosing workstations far away from each other. Further, the analysis showed that leaders were inclined to occupy workstations beside the main corridor in the center of the office while ordinary staff members preferred workstations near the entrance.

Keywords: workplace; non-territorial office; workstation; consistency

1. Introduction
With the development of information technology, work styles have been evolving constantly, placing a progressively growing emphasis on information sharing and communication. Instead of the traditional territorial offices with fixed individual workplaces and personal document stores, the non-territorial space system, which involves a shared workplace, is being increasingly applied in offices in Japan.

In a non-territorial office, employees may locate themselves freely. There are two types of execution in practice. In the first type, employees are assigned self-owned desks and may move them to anywhere they wish. The other allows employees to occupy any workstation for their personal work, but once such work is over the employees are instructed to vacate the workstation, taking their personal belongings (laptops or documents) with them, so that the workstation is free to be occupied by the next employee.

Several studies have been conducted on the two above-mentioned types of non-territorial offices. Some of them concentrated on satisfaction evaluation. For instance, Shimamura et al. (1996) evaluated users’ satisfaction by framing a questionnaire and soliciting responses before and after an office was transferred to the non-territorial arrangement. Communication was another area that was generally regarded as having been affected by the shift toward non-territorial offices. Allen et al. (1973) traced the variations in communication in a year-long investigation into a non-territorial office that was of the free-choice workstation type. Yamada et al. (2000) compared the volumes of communication among offices in different states of transformation by employing periodic photo-shoots. There are also studies that analyze employee behavior. Yamada et al. (1996) clarified how communication between employees was affected by changes in the office layout. Mori et al. (2002) clarified the relationship between the layout plan and the working style in an office; the study included investigations into the staying places, content of working behavior and moving times. However, it is unclear how employees chose their workstations in a non-territorial office.

2. Purpose & Significance
This paper attempts to clarify the employee behavior of choosing personal workstations in a non-territorial
office. The purposes of the study are outlined in detail below:

1) To clarify who occupied which workstation; in other words, to clarify the relationship between the location of personal workstations and the employees' attributes.

2) To clarify whether employees are used to occupying specific workstations consistently, and to ascertain the relationship between the consistency of occupancy and the employees' attributes.

An office with an open floor plan is usually shared by employees belonging to different departments or groups, who have different work styles and need workplaces that fit their specific work styles. Some work styles in a non-territorial office are suggested by the way employees choose their workstations. By interpreting employees' choices of workstations, the authors may discover ways to improve non-territorial office spaces.

3. Method
3.1 Basic information on a non-territorial office that is the subject of the authors' investigation

A non-territorial office of an architecture design company with 100 registered employees is chosen as the subject of investigation (Table 1., Fig.1.). The total area under investigation is 381.8 m². It is composed of a main working space (including individual workstations and meeting corners) and surrounding service spaces (including meeting spaces for larger meetings, copy corners, lockers for personal belongings and shared documents). A row of document lockers separates the investigation area into two parts: one beside the window (Window area) and the other composed of big tables (Table area). Furthermore, the Table area is assigned to three groups: the Architecture Design Group, Structure Group and Equipment Group. However, the assigning of territories is merely a reference. Employees are not restricted to locations within their department territories; they may choose any workstation in the office according to their needs.

In a non-territorial office, a day starts with taking out laptops from...
lockers, and choosing a workstation to do one's work; a day ends with tidying up one's workstation, clearing it of all personal belongings, and leaving it free to be occupied by someone else.

3.2 Investigation based on choice of workstations

The investigation was conducted over nine successive weekdays, from November 18 to November 28, 2008. Employees in the investigation area were assigned UWB devices randomly. Then, employee names and the individual workstations they chose for themselves at the time were recorded (Table 2.).

3.3 Database

The workstations in the investigation area were classified according to their positions. Vertically, the workstations were divided into two groups; one was next to the north-south corridor (Corridor Side) and the other was next to the meeting corners (Meeting Corner Side). Horizontally, the workstations were divided into five rows (Window Row, Inner Row, Middle Row 1, Middle Row 2 and Outer Row). The Window Area was divided into five sub-areas (W1~W5) and the Table Area into eight sub-areas according to the tables (T1~T8) (Fig.2.). Employees in the three departments in the office belonged to five groups: Architecture Group 1 to Group 3, the Structure Group and the Equipment Group. Employees could also be classified into three types by the nature of the post held: Leader, Ordinary Staff and Temporary Staff.

Combining the names, attributes, IDs and workstation positions of the investigated employees, a database was built and analyzed, as shown in Table 3.

4. Relationship between the Position of Workstations and the Attributes of Employees

4.1 Position of workstation, as chosen by each group

Most employees in the engineering groups (Structure Group and Equipment Group) gathered in adjacent areas. The Equipment Group always chose workstations in areas T7, T8 and W5, which were assigned to the group. Most employees of the Structure Group chose workstations in areas T5, T6 and W4; there was however one employee from the Structure Group who chose workstations in the T7 area, which was generally occupied by members of the Equipment Group. (Fig.3.)

In contrast, employees belonging to the Architecture Design Groups not only chose workstations within their own territory, but also occupied workstations that were in the territory of the engineering groups (W4, W5, T5~T8). In more than 1/4th of all occupancy times, workstations that were in the territory of the Structure Group were occupied by employees from the Architecture Design Group. The dispersed distribution of workstations among employees of the Architecture Design Groups could quite reasonably be the result of there being more employees in these groups, which necessitates more workstations than the number provided in the assigned territory. The workstations in the territory assigned to the Structure Group are usually preferred by the Architecture Design Group, because these are next to the Architecture Design territory.

With the exception of a single instance when Architecture Group 2 occupied T2 in order to work on a competition project, the three groups of architecture design are generally inclined to share areas rather than maintain clear group territories. Architecture Group 1 and Group 2 shared T1, T3, T6, T7, W1, W2 and W4. Architecture Group 1 and Group 3 shared T5. Architecture Group 2 and Group 3 shared W3, while T4 was consistently occupied by all of the architecture groups, and Architecture Group 3 in particular. In contrast to the steady occupation of Group 3, the other two architecture groups were more inclined to occupy workstations spread over a wider area. Architecture Group 2 had occupied nearly all areas except for T5 and W5; similarly, Architecture Group 1 had occupied nearly all areas except for workstations in T2, W3 and T8. (Fig.4.)

Leaders were found to be inclined to choose workstations in the Table Area. Leaders in the engineering groups always stayed in their own territories, and leaders in each of the architecture groups were found to prefer workstations in areas that were densely occupied by employees from their own group (close to or higher than 50%). Architecture Group 1 was found to mainly choose workstations
in T1. Architecture Group 2 primarily preferred workstations in T3, T4 and W3. Architecture Group 3 mainly chose workstations in T4. It was also possible however, for leaders in these groups to choose workstations in areas that were far from the general preference of the group. (Fig.5.)

4.2 Choices of workstations in different positions

1) Choices counted by horizontal division of workstations

For all the investigated employees, there were overall more occupancies in the Inner and Outer rows. This might have been because the shape of the tables became narrow toward the ends, thereby shortening the distance between workstations on opposite sides, and making it easier for face-to-face communication to take place. Moreover, the Inner and Outer rows are next to the main corridors, which make it convenient for employees to go to other tables from there. (Fig.6.)

The preferences of the ordinary staff members were found to be in the following order: Outer Row, Middle Row 1, Middle Row 2, Inner Row and Window Row. This showed that ordinary employees preferred workstations that were near the entrance over those that were further in. (Fig.7.)

The leaders occupied the Inner Row much more often than any of the other rows. In particular, Architecture Group 1, Architecture Group 2 and the Structure Group showed a clear tendency to choose workstations in the Inner Row. This might be because the Inner Row is located between the Window Area and the Table Area, next to the main corridor in the middle of the office, which makes it the ideal position to communicate with employees in either direction. (Fig.8.)

The temporary staff members chose workstations in the Window Row more than the other rows. (Fig.9.)

2) Choices counted based on vertical division of workstations

For all the investigated employees, there were more occupancies of the Meeting Corner Side than the Corridor Side. (Fig.10.)

Ordinary staff members in Architecture Group 1 and Group 2 were inclined to occupy workstations on the Meeting Corner Side, but Architecture Group 3 and the engineering groups preferred workstations on the Corridor Side. (Fig.11.)

The leaders of the Architecture groups were inclined to choose workstations on the Meeting Corner Side, but leaders of the Equipment groups did not exhibit such a tendency. (Fig.12.)

Temporary staff members were inclined to choose workstations on the Corridor Side. (Fig.13.)

5. Consistency in choice of workstations

5.1 Classification of consistency in choice of workstations

Though employees may locate themselves anywhere in a non-territorial office, some of them have been
observed to consistently choose a certain workstation or workstations in a certain area. In order to understand such behavior, employees who were investigated more than three times were selected as subjects, and a Consistency Ratio (CR) was calculated according to the following formula:

$$CR = \frac{\text{Number of times a certain employee has chosen the same workstation}}{\text{Total number of times this employee has been investigated}}$$

The authors show below the four classifications in choices of workstations, based on CR values:

1. **Same Workstation**: $CR = 1$; the employee always chooses the same workstation.
2. **Same Workstation Mainly (Adjacent)**: $0.5 < CR < 1$; the employee is inclined to choose the same workstation every time, and all chosen workstations are adjacent.
3. **Same Workstation Mainly (Nonadjacent)**: $0.5 < CR < 1$; the employee is inclined to choose the same workstation every time, but not all chosen workstations are adjacent.
4. **Multi-Workstation**: $CR < 0.5$, the employee is less inclined to repeat his choice of workstations.

Furthermore, the distribution of the chosen workstations is classified into 3 types as shown below:

1. **Same Area**: the chosen workstations are in the same area. (Area division is shown in Fig.2.)
2. **Multi-area (Adjacent)**: the chosen workstations are in adjacent multiple areas. (For instance, the...
chosen workstations are in T6 and W4)

3 Multi-area (Nonadjacent): the chosen workstations are in nonadjacent multiple areas.

5.2 Consistency of all the investigated workers

According to Fig. 14., 37% of all the employees always choose the same workstation. Thirty-six percent of the employees mainly choose the same workstation, and even if they choose a different workstation, half of them choose workstations adjacent to the one they often choose.

Furthermore, 63% of the employees chose workstations in the same area, and 90% of the employees located themselves in the same or adjacent areas. Only 10% of the employees chose workstations in distant areas. (Fig. 15.)

5.3 Consistency analysis by group

According to Fig. 16. and Fig. 17., the engineering groups (Structure Group and Equipment Group) were inclined to choose the same workstation every time or nearly every time, and most of their workstations are in the same area. The Structure Group had the highest ratio of choosing the same workstation every time (80% of their employees always choose the same workstation). Employees in the Structure Group always chose workstations in the same area (90%) or adjacent areas (10%). Four employees in the Structure Group always choose the same workstations in T5. (Fig. 18.)

Despite the fact that only 33% of the employees in the Equipment Group always chose the same workstations, as many as 50% of them chose the same workstation and mainly chose adjacent workstations. Moreover, all the employees in the Equipment Group located themselves in the same area. Employees in Architecture Group 3 were mainly inclined to choose the same workstation (60% of the employees mainly chose the same workstation, including adjacent and non-adjacent ones), and all the chosen workstations were in the same or adjacent areas.

In the ascending order of the likelihood of their employees choosing multi-workstations, the various groups line up as follows: Structure
Group, Architecture Group 3, Group 2 and Group 1. In Architecture Group 1, half of the employees demonstrated a markedly lower tendency to choose the same workstation, but 90% of the workstations they chose were concentrated in the same or adjacent areas. In Architecture Group 2, 30% of the employees always chose the same workstation, which was more than that observed in the other architecture groups, but most of these employees were engaged in preparing for a competition project and were seated in T2 (Fig.18.). The percentage of employees who chose multi-workstations in Architecture Group 2 (35%) was not as high as in Architecture Group 1 (50%), but there were more employees in Group 2 who located themselves in nonadjacent multiple areas (20%). This shows that employees in Architecture Group 2 were distributed more dispersely than in any other group.

5.4 Consistency analysis by post held
A similar percentage of leaders and ordinary staff members always chose the same workstations (40% — leaders, 41% — ordinary staff members). Leaders and ordinary staff members also had similar distributions of chosen workstations. Leaders, however, were markedly more inclined to choose the same workstation on most occasions, and when they chose different workstations, these were not necessarily adjacent to their regular ones. Ordinary staff members were more likely to change their workstation often (32%).

None of temporary staff members chose the same workstations regularly, but half of them worked centered on certain workstations and most of them chose workstations in the same area (75%). None of them chose workstations in nonadjacent areas (Figs.19, Fig.20.).

6. Conclusions
This paper analyzed the behavior of employees in choosing personal workstations in a non-territorial office. The authors' study ascertains the preference of employees with regard to the position of their workstations and the consistency of choosing the same workstations. Their findings are shown below:

1) For all investigated employees, there was a tendency of choosing workstations next to the main corridors and meeting corners.

Although the employees were free to locate anywhere they wished, more than 70% of them always chose the same workstation or chose the same workstation on most occasions; in total, 90% of the employees located themselves in the same or adjacent areas. Only 10% of the employees chose workstations that were dispersed over the office area.

2) Groups behaved differently from each other when it came to choosing workstations. Nearly all employees in the engineering groups gathered in adjacent areas in each assigned territory. All the employees in the Equipment Group located themselves in the same area and most of the employees in the Structure Group chose the same workstations.

The employees in the architecture design groups also used workstations in the engineering group territory, and shared areas with each other. Architecture Group 3 and the competition team in Architecture Group 2 mirrored the behavior of the engineering groups, which were inclined to locate in one area and use it consistently. However, other employees in Architecture Group 2 and Architecture Group 1 chose workstations that were dispersed; these employees showed a greater tendency to change workstations, on a daily basis, and even over distant areas.

3) The leaders were inclined to occupy the workstations in the Inner Row; the leaders of the Architecture groups showed an obvious tendency to choose workstations next to the meeting corners. Ordinary staff members were inclined to choose workstations next to the entrance, and temporary staff members preferred to occupy workstations that were adjacent to the secondary corridors.

With regard to the findings outlined above, some improvements can be considered while customizing
the office space. For instance, since the engineering groups are inclined to use certain areas consistently, some workplaces in the engineering territory can be fixed, allowing employees to store documents that are often used. A specific and fixed workplace should be provided for the competition team. The number of meeting corners in the architecture design territory may be appropriately increased. This study yielded preliminary results of the authors' investigation on the work styles of employees in non-territorial offices. Next, the authors will further clarify trends in workstation use by quantitatively measuring the time allocation of employees in each of their chosen locations. They also expect to obtain more findings on the relationship between the behavior of employees and productivity in a non-territorial office.

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Notes
1 Another investigation using UWB sensors was conducted parallel to this study. UWB sensors are a set of devices, composed of terminals, antennae and computer servers, which facilitate location positioning. When an employee wearing a UWB terminal enters the detection area of the antennae, his position can be obtained.
2 The leader of the Structure Group moved his workstation to a special position, which was at the end of T5, neither on the Corridor Side nor on the Meeting Corner Side. Therefore, his occupancy times were counted by the horizontal way only, and not the vertical way.

References